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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/775,913	02/10/2004	Joseph J. Bergmeister	60605-00010USPT	1222
37814 7590 05/16/2007 CHEVRON PHILLIPS CHEMICAL COMPANY 5700 GRANITE PARKWAY, SUITE 330 PLANO, TX 75024-6616			EXAMINER BOYER, RANDY	
			ART UNIT 1764	PAPER NUMBER
			MAIL DATE 05/16/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

4

**Office Action Summary**

Application No.

10/775,913

Applicant(s)

BERGMEISTER ET AL.

Examiner

Randy Boyer

Art Unit

1764

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --****Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 26 March 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-4, 6-22 and 24-43 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4, 6-22 and 24-43 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |  |
|---|--|
| <p>1) <input type="checkbox"/> Notice of References Cited (PTO-892)</p> <p>2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)</p> <p>3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br/>Paper No(s)/Mail Date _____.</p> | <p>4) <input type="checkbox"/> Interview Summary (PTO-413)<br/>Paper No(s)/Mail Date. _____.</p> <p>5) <input type="checkbox"/> Notice of Informal Patent Application</p> <p>6) <input type="checkbox"/> Other: _____.</p> |
|---|--|

## **DETAILED ACTION**

### ***Response to Amendment***

1. Examiner acknowledges response filed 26 March 2007 containing amended claims 1, 19, 41, and remarks.
2. The previous rejection of claims 1-4, 6, 9-16, 19-22, 24, and 27-40 under 35 U.S.C. 102(b) is maintained.
3. The previous rejection of claims 1, 6-8, 17, 18, 25, 26, and 41-43 under 35 U.S.C. 103(a) is maintained.
4. Finally, a new ground for rejection necessitated by Applicant's amendment of the claims is entered with respect to claims 1-4, 6, 9-16, 19-22, 24, and 27-40. The rejections follow.

### ***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-4, 6, 9-16, 19-22, 24, and 27-40 are rejected under 35 U.S.C. 102(b) as being anticipated by Thanh (US 6054409).

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7. With respect to claim 1, Thanh discloses a catalyst for the selective hydrogenation of acetylene (column 1, lines 14-17), comprising (a) an alumina support (column 3, line 19), wherein the support has a round external surface (column 3, line 21), a surface area of  $10 \text{ m}^2/\text{g}$  (column 5, line 8), a pore volume of  $0.6 \text{ cm}^3/\text{g}$  (column 5, line 9) and has an average pore diameter greater than 100 Angstroms (column 3, lines 25-26); (b) palladium in the amount 0.025 % by weight of catalyst (column 5, line 11), wherein substantially all of the palladium is concentrated in a skin periphery of the catalyst (column 4, lines 61-64), and wherein the skin has a thickness of 400 microns (column 4, lines 62-64); and (c) silver in an amount 2 times the weight of the palladium (column 5, line 12), wherein the silver is distributed throughout the catalyst (column 4, lines 61-64).
8. With respect to claims 2-4, Thanh discloses a support in the form of spherules or extrudates (column 3, line 21).
9. With respect to claim 6, Thanh discloses a catalyst further comprising an alkali metal present at 2% by weight of the catalyst (column 3, line 62).
10. With respect to claim 9, Thanh discloses catalyst particles in the range 2 mm to 4 mm (column 3, line 22).
11. With respect to claims 10 and 11, Thanh discloses a catalyst with a weight ratio of silver to palladium of 2 (column 4, line 59).
12. With respect to claim 12, Thanh discloses a catalyst containing 0.025 weight percent palladium (column 4, line 58).

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13. With respect to claim 13, Thanh discloses preparing a catalyst by impregnating alumina particles with a solution of palladium nitrate (column 4, lines 50-53).

14. With respect to claim 14, Thanh discloses preparing a catalyst by mixing the catalyst particles with a solution of silver nitrate (column 4, lines 50-53).

15. With respect to claim 15, Thanh discloses a selectivity of the catalyst for the conversion of acetylene to ethylene greater than 40% (column 7, Table 1).

16. With respect to claim 16, Thanh discloses a catalyst wherein the palladium is 0.025% by weight of the catalyst (see column 5, line 10).

17. With respect to claim 19, Thanh discloses a method for the treatment of a gaseous mixture comprising acetylene, which method comprises selectively hydrogenating the acetylene therein by contacting the mixture together with hydrogen with a catalyst with a catalyst; wherein the catalyst comprises an alumina support, wherein the support has a round external surface, a surface area of  $10 \text{ m}^2/\text{g}$  (column 5, line 8), a pore volume of  $0.6 \text{ cm}^3/\text{g}$  (column 5, line 9) and has an average pore diameter greater than 100 Angstroms (column 3, lines 25-26); wherein the catalyst comprises palladium in the amount 0.025 % by weight of catalyst (column 5, line 11), wherein substantially all of the palladium is concentrated in a skin periphery of the catalyst (column 4, lines 61-64), and wherein the skin has a thickness of 400 microns (column 4, lines 62-64); and wherein the catalyst comprises silver in an amount 2 times the weight of the palladium (column 5, line 12), wherein the silver is distributed throughout the catalyst (column 4, lines 61-64).

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18. With respect to claims 20-22, Thanh discloses a support in the form of spherules or extrudates (column 3, line 21).

19. With respect to claim 24, Thanh discloses a catalyst further comprising an alkali metal present at 2% by weight of the catalyst (column 3, line 62).

20. With respect to claim 27, Thanh discloses wherein the gaseous mixture contains less than about 1000 ppm of carbon monoxide (column 6, lines 48-49).

21. With respect to claims 28 and 30, Thanh discloses wherein the weight ratio of silver to palladium in the catalyst is 2 (column 5, lines 10-12).

22. With respect to claim 29, Thanh discloses wherein the dimensions of the catalyst particles are in the range 2mm to 4mm (column 3, line 22).

23. With respect to claim 31, Thanh discloses a hydrogenation temperature of 50°C and space velocity of 3300 h<sup>-1</sup> (column 6, lines 53 and 58).

24. With respect to claim 32, Thanh discloses wherein the gas mixture contains no more than about 800 ppm of carbon monoxide (column 6, lines 48-49).

25. With respect to claim 33, Thanh discloses wherein the catalyst is prepared by impregnating alumina particles with a palladium solution (column 4, line 53), calcining the impregnated alumina particles (column 4, line 57), and mixing the particles with an aqueous solution of silver nitrate (column 4, line 53).

26. With respect to claim 34, Thanh discloses wherein the catalyst contains 0.025% by weight of palladium (column 4, line 58).

27. With respect to claim 35, Thanh discloses wherein the catalyst is housed in a vessel (column 6, lines 50-51), further comprising: (a) flowing the acetylene through the

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vessel to contact the catalyst (column 6, lines 56-58); (b) flowing a heat transfer fluid across an exterior surface of the vessel to remove heat from the vessel (column 6, line 54); and (c) modulating the flow of heat transfer fluid to maintain a temperature of the heat transfer fluid within a predetermined range (column 6, lines 51-52).

28. With respect to claim 36, Thanh discloses a hydrogenation temperature of 50°C (column 6, line 54).

29. With respect to claims 37 and 39, Thanh discloses wherein a selectivity of the catalyst for the conversion of acetylene to ethylene is greater than 50% (column 7, Table 1).

30. With respect to claims 38 and 40, Thanh discloses wherein the palladium is 0.025% by weight of the catalyst (column 4, line 58).

### ***Claim Rejections - 35 USC § 103***

31. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

32. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.

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3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

33. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

34. Claims 1-4, 6, 9-16, 19-22, 24, and 27-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thanh (US 6054409).

35. With respect to claim 1, Thanh discloses a catalyst for the selective hydrogenation of acetylene (column 1, lines 14-17), comprising (a) an alumina support (column 3, line 19), wherein the support has a round external surface (column 3, line 21), a surface area of 10 m<sup>2</sup>/g (column 5, line 8), and a pore volume of 0.6 cm<sup>3</sup>/g (column 5, line 9); (b) palladium in the amount 0.025 % by weight of catalyst (column 5, line 11), wherein substantially all of the palladium is concentrated in a skin periphery of the catalyst (column 4, lines 61-64), and wherein the skin has a thickness of 400 microns (column 4, lines 62-64); and (c) silver in an amount 2 times the weight of the palladium (column 5, line 12), wherein the silver is distributed throughout the catalyst (column 4, lines 61-64).



Thanh does not disclose wherein the support has an average pore diameter from about 600 Angstroms to about 5000 Angstroms.

However, Thanh discloses wherein the support has an average pore diameter of greater than 100 Angstroms (see Thanh, column 3, lines 25-26). In such case, where the claimed ranges "overlap or lie inside ranges disclosed by the prior art," a prima facie case of obviousness exists. See MPEP § 2144.05 (citing *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976)).

36. With respect to claims 2-4, Thanh discloses a support in the form of spherules or extrudates (column 3, line 21).

37. With respect to claim 6, Thanh discloses a catalyst further comprising an alkali metal present at 2% by weight of the catalyst (column 3, line 62).

38. With respect to claim 9, Thanh discloses catalyst particles in the range 2 mm to 4 mm (column 3, line 22).

39. With respect to claims 10 and 11, Thanh discloses a catalyst with a weight ratio of silver to palladium of 2 (column 4, line 59).

40. With respect to claim 12, Thanh discloses a catalyst containing 0.025 weight percent palladium (column 4, line 58).

41. With respect to claim 13, Thanh discloses preparing a catalyst by impregnating alumina particles with a solution of palladium nitrate (column 4, lines 50-53).

42. With respect to claim 14, Thanh discloses preparing a catalyst by mixing the catalyst particles with a solution of silver nitrate (column 4, lines 50-53).

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43. With respect to claim 15, Thanh discloses a selectivity of the catalyst for the conversion of acetylene to ethylene greater than 40% (column 7, Table 1).

44. With respect to claim 16, Thanh discloses a catalyst wherein the palladium is 0.025% by weight of the catalyst (see column 5, line 10).

45. With respect to claim 19, Thanh discloses a method for the treatment of a gaseous mixture comprising acetylene, which method comprises selectively hydrogenating the acetylene therein by contacting the mixture together with hydrogen with a catalyst with a catalyst; wherein the catalyst comprises an alumina support, wherein the support has a round external surface, a surface area of  $10 \text{ m}^2/\text{g}$  (column 5, line 8), and a pore volume of  $0.6 \text{ cm}^3/\text{g}$  (column 5, line 9); wherein the catalyst comprises palladium in the amount 0.025 % by weight of catalyst (column 5, line 11), wherein substantially all of the palladium is concentrated in a skin periphery of the catalyst (column 4, lines 61-64), and wherein the skin has a thickness of 400 microns (column 4, lines 62-64); and wherein the catalyst comprises silver in an amount 2 times the weight of the palladium (column 5, line 12), wherein the silver is distributed throughout the catalyst (column 4, lines 61-64).

46. With respect to claims 20-22, Thanh discloses a support in the form of spherules or extrudates (column 3, line 21).

47. With respect to claim 24, Thanh discloses a catalyst further comprising an alkali metal present at 2% by weight of the catalyst (column 3, line 62).

48. With respect to claim 27, Thanh discloses wherein the gaseous mixture contains less than about 1000 ppm of carbon monoxide (column 6, lines 48-49).

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49. With respect to claims 28 and 30, Thanh discloses wherein the weight ratio of silver to palladium in the catalyst is 2 (column 5, lines 10-12).

50. With respect to claim 29, Thanh discloses wherein the dimensions of the catalyst particles are in the range 2mm to 4mm (column 3, line 22).

51. With respect to claim 31, Thanh discloses a hydrogenation temperature of 50°C and space velocity of 3300 h<sup>-1</sup> (column 6, lines 53 and 58).

52. With respect to claim 32, Thanh discloses wherein the gas mixture contains no more than about 800 ppm of carbon monoxide (column 6, lines 48-49).

53. With respect to claim 33, Thanh discloses wherein the catalyst is prepared by impregnating alumina particles with a palladium solution (column 4, line 53), calcining the impregnated alumina particles (column 4, line 57), and mixing the particles with an aqueous solution of silver nitrate (column 4, line 53).

54. With respect to claim 34, Thanh discloses wherein the catalyst contains 0.025% by weight of palladium (column 4, line 58).

55. With respect to claim 35, Thanh discloses wherein the catalyst is housed in a vessel (column 6, lines 50-51), further comprising: (a) flowing the acetylene through the vessel to contact the catalyst (column 6, lines 56-58); (b) flowing a heat transfer fluid across an exterior surface of the vessel to remove heat from the vessel (column 6, line 54); and (c) modulating the flow of heat transfer fluid to maintain a temperature of the heat transfer fluid within a predetermined range (column 6, lines 51-52).

56. With respect to claim 36, Thanh discloses a hydrogenation temperature of 50°C (column 6, line 54).

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57. With respect to claims 37 and 39, Thanh discloses wherein a selectivity of the catalyst for the conversion of acetylene to ethylene is greater than 50% (column 7, Table 1).

58. With respect to claims 38 and 40, Thanh discloses wherein the palladium is 0.025% by weight of the catalyst (column 4, line 58).

59. Claims 1, 6-8, 17, 18, 25, 26, and 41-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cheung (US 5475173) in view of Thanh (US 6054409) or, alternatively, in view of Thanh (US 6054409) and Likins (US 2946829).

60. With respect to claim 1, Cheung discloses a catalyst for the selective hydrogenation of acetylene, comprising: (a) an alumina support (see Cheung, column 5, line 36), wherein the support has a round external surface (see Cheung, column 5, lines 27-28), and a surface area in the range 1-200 m<sup>2</sup>/g (see Cheung, column 2, line 64); (b) 0.28% palladium by weight of the catalyst (see Cheung, column 6, line 21); and (c) 2.6% silver by weight of the catalyst (see Cheung, column 6, line 22).

Cheung does not disclose a support having a pore volume of about 0.24 to about 0.64 cm<sup>3</sup>/g, and an average pore diameter from about 600 Angstroms to about 5000 Angstroms; or concentrating the palladium in the skin periphery of the catalyst wherein the skin thickness is less than about 400 microns.

However, Thanh discloses a catalyst for the selective hydrogenation of acetylene (see Thanh, column 1, lines 14-17), comprising (a) an alumina support (see Thanh, column 3, line 19), wherein the support has a round external surface (see Thanh, column 3, line 21), a surface area of 10 m<sup>2</sup>/g (see Thanh, column 5, line 8), a pore

volume of  $0.6 \text{ cm}^3/\text{g}$  (see Thanh, column 5, line 9) and an average pore diameter greater than 100 Angstroms (see Thanh, column 3, lines 25-26); (b) palladium in the amount 0.025 % by weight of catalyst (see Thanh, column 5, line 11), wherein substantially all of the palladium is concentrated in a skin periphery of the catalyst (see Thanh, column 4, lines 61-64), and wherein the skin has a thickness of 400 microns (see Thanh, column 4, lines 62-64); and (c) silver in an amount 2 times the weight of the palladium (see Thanh, column 5, line 12), wherein the silver is distributed throughout the catalyst (see Thanh, column 4, lines 61-64). Furthermore, it is known in the art that using a catalyst support having small pore volume and concentrating a palladium catalyst solution upon the surface of such carrier will provide for high catalyst activity at lower reaction temperatures and prolonged catalyst activity over extended periods of use (see e.g., Likins (US 2946829) at columns 2 and 3).

Therefore, it would have been obvious to the person having ordinary skill in the art at the time the invention was made to modify the invention of Cheung so as to incorporate the use of a catalyst support having a small pore volume and impregnating such support so as to concentrate the palladium catalyst in the skin periphery.

61. With respect to claim 6, Thanh discloses a catalyst further comprising an alkali metal present at 2% by weight of the catalyst (see Thanh, column 3, line 62).

62. With respect to claims 7, 8, 25, and 26 Cheung discloses a catalyst further comprising fluoride in the range of about 0.1 to 10 times the molar concentration of potassium present in the catalyst (see Cheung, column 2, lines 65-67, and column 3, lines 1-7).

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63. With respect to claim 17, Cheung discloses a catalyst having a selectivity for the conversion of acetylene to ethylene greater than 50% (see Cheung, Table I).

64. With respect to claim 18, Cheung discloses a catalyst wherein the palladium is 0.28 weight percent of the catalyst (see Cheung, column 6, line 21).

65. With respect to claim 41, the prior art discloses a catalyst for the selective hydrogenation of acetylene, comprising: (a) an alpha alumina support (see Thanh, column 3, line 19), wherein the support has a round external surface (see Thanh, column 3, line 21), a surface area of  $10 \text{ m}^2/\text{g}$  (see Thanh, column 5, line 8), a pore volume of  $0.6 \text{ cm}^3/\text{g}$  (see Thanh, column 5, line 9), and a pore diameter of greater than 100 Angstroms (see Thanh, column 3, line 26); (b) palladium in the amount 0.025 % by weight of catalyst (see Thanh, column 5, line 11), wherein substantially all of the palladium is concentrated in a skin periphery of the catalyst (see Thanh, column 4, lines 61-64), and wherein the skin has a thickness of 400 microns (see Thanh, column 4, lines 62-64); (c) silver in an amount 2 times the weight of the palladium (see Thanh, column 5, line 12), wherein the silver is distributed throughout the catalyst (see Thanh, column 4, lines 61-64); (d) potassium at 1.3 weight % of the catalyst (see Cheung, column 6, line 22); and (e) fluoride in the range 0.1 to 10 times the molar concentration of the potassium present in the catalyst (see Cheung, column 3, lines 5-6).

66. With respect to claim 42, Cheung discloses a catalyst having a selectivity for the conversion of acetylene to ethylene greater than 50% (see Cheung, Table I).

67. With respect to claim 43, Thanh discloses a catalyst containing palladium 0.025% palladium by weight of the catalyst (see Thanh, column 4, line 58).

***Response to Arguments***

68. Applicant's arguments filed 26 March 2007 have been fully considered, but they are not persuasive.

69. Examiner understands Applicant's principal arguments to be:

- I. The catalyst and processes described by Applicant are not anticipated by Thanh, which reports a catalyst having silver concentrated in the periphery and teaches away from the use of a catalyst having silver distributed throughout the material.
- II. Examiner has not met the burden of establishing a *prima facie* case of obviousness because Cheung does not teach or suggest each and every element recited in the amended claims.

70. For clarity, the references cited herein are: Thanh (US 6054409), Cheung (US 5475173), and Likins (2946829).

71. With respect to Applicant's first argument, Thanh teaches the use of a catalyst having silver distributed throughout the material. Examiner acknowledges that the majority of silver in Thanh's catalyst will be found in the periphery of the material. As Thanh explains, "[Analysis] shows that more than 80% of the silver and almost all of the palladium were concentrated in a volume delimited by a sphere with radius  $r_1=2$  mm and a sphere with radius  $r_2$  of 1.6 mm" (see Thanh, column 4, lines 61-64).

However, what Thanh's disclosure also implies is that at least about 20% of the silver will be found *beyond* the catalyst's periphery. Thus, while Thanh discloses a majority of the silver concentrated at the periphery of the catalyst, the remainder of the silver will necessarily be found dispersed *throughout* the catalyst.

Applicant does not claim an *even* distribution of the silver throughout the catalyst, but rather only that the "silver is distributed throughout the catalyst." Therefore, Thanh's disclosure meets the limitation of Applicant's claims that silver be distributed throughout the catalyst.

72. With respect to Applicant's second argument, Examiner submits that a *prima facie* case of obviousness was made in the first Office Action. Nevertheless, for Applicant's benefit and clarity of the record, a second and more detailed analysis follows.

To begin with, Applicant asserts that "Examiner has not met the burden of establishing a *prima facie* case of obviousness because Cheung does not teach or suggest each and every element recited in the amended claims." Examiner acknowledges that Cheung *alone* does not teach or suggest each and every element recited in the claims. Had such been the case, the proper rejection would have been made under 35 U.S.C. 102 (anticipation) and not 35 U.S.C. 103 (obviousness). Thus, the only requirement is that the *combination* of Cheung and Thanh teach or suggest each and every element recited in the claims.

A *prima facie* case of obviousness requires that three elements be met: (1) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; (2) there must be a reasonable expectation of success; and (3) the prior art reference (or references when combined) must teach or suggest all the claim limitations.



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With respect to the first element, Examiner points to Likins as representative of the knowledge generally available to one of ordinary skill in the art. Likins is directed to the selective hydrogenation of acetylenes and diolefins in gas mixtures using a palladium catalyst (see Likins, column 1, lines 14-21). Likins explains the procedure for catalyst preparation, and particularly the relation between pore volume and catalyst activity and strength. Specifically, Likins notes:

.....[T]he catalytically active material of our improved catalyst comprises palladium. The catalyst is prepared by spraying a concentrated solution of a palladium salt onto a carrier comprising alumina with a pore volume of between 0.0 to 0.4 cc./gm. at a threshold diameter of 800 A. and less. Preferred are alumina pellets having a surface pore volume in the range specified and an interior pore volume in the finished catalyst from 0.02 to 0.05 cc./gm. greater than that of the surface, at the same threshold level of measurement .  
..... **Because of the limited amount of solution used and the method of application the metal [i.e. palladium] is deposited upon the surface of the carrier and is not dispersed homogenously throughout.** It has been found that by this method of preparation the pore volume of the outer surface of the catalyst is reduced to less than that of the original carrier. However, an even more unexpected phenomenon occurs in that the pore volume of the interior of the catalyst pellet, although greater than the exterior, is reduced in relation to the pore volume of the original carrier material.

While the effect of such phenomenon may not be readily appreciated, it has been found that the catalyst so prepared will maintain its activity at low temperatures in a concentrated olefin stream without the addition of steam. The catalyst has been found to be active with dry gas at temperatures as low as 100°F. and generally in the range of 125 to 400°F. and will effectively reduce the concentration of the unsaturated contaminants to a level of a few parts per million with as little as 30% stoichiometric excess of hydrogen. **More surprisingly, however, is the fact that the catalyst does not suffer a permanent loss of activity even under extended periods of use.**

**As previously indicated, there is an effect of the pore volume reduction in relation to the activity and physical strength of the catalyst under process conditions** (see Likins, column 2, lines 37-72; and column 3, lines 1-12) (emphasis added).

Thus, Likins explains that a catalyst having a small pore volume (which would also correspond to a small average pore diameter) and concentrating palladium on the surface of the catalyst will lead to prolonged catalyst life (i.e. sustained catalytic activity over an extended period of time) and greater physical strength.

Therefore, the person having ordinary skill in the art (and with appreciation of Likins) would be **motivated to modify** the catalyst of **Cheung** so as to incorporate the use of a catalyst support having a small pore volume, small average pore diameter, and concentrating palladium upon the surface of such carrier (i.e. at its "periphery") **as taught by Thanh in order to obtain a selective hydrogenation catalyst exhibiting greater catalytic over a prolonged period of use and having increased physical strength.**

With respect to the second element, the person having ordinary skill in the art would have a reasonable expectation of success because (1) both Cheung and Thanh are directed to the selective catalytic hydrogenation of unsaturated hydrocarbons; (2) both Cheung and Thanh propose the use of a palladium/silver catalyst on an alumina support; and (3) both Cheung and Thanh propose similar hydrogenation conditions of temperature and pressure (see Cheung, column 4, lines 24-31; and Thanh, column 4, lines 30-32).

Finally, with respect to the third element, Examiner submits that the combined teachings of Cheung and Thanh meet all of the claim limitations as set forth in the previous Office Action and as is repeated herein at paragraphs 60-67 *supra*.

### **Conclusion**

73. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.


74. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Randy Boyer whose telephone number is (571) 272-7113. The examiner can normally be reached Monday through Friday from 8:00 A.M. to 5:00 P.M.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola, can be reached at (571) 272-1444. The fax number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RPB



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